



# **Armed Forces College of Medicine AFCM**



# The Anal Canal

## By

# Prof Azza Kamal

# INTENDED LEARNING OBJECTIVES (ILOs)



**By the end of this lecture the student will be able to:**

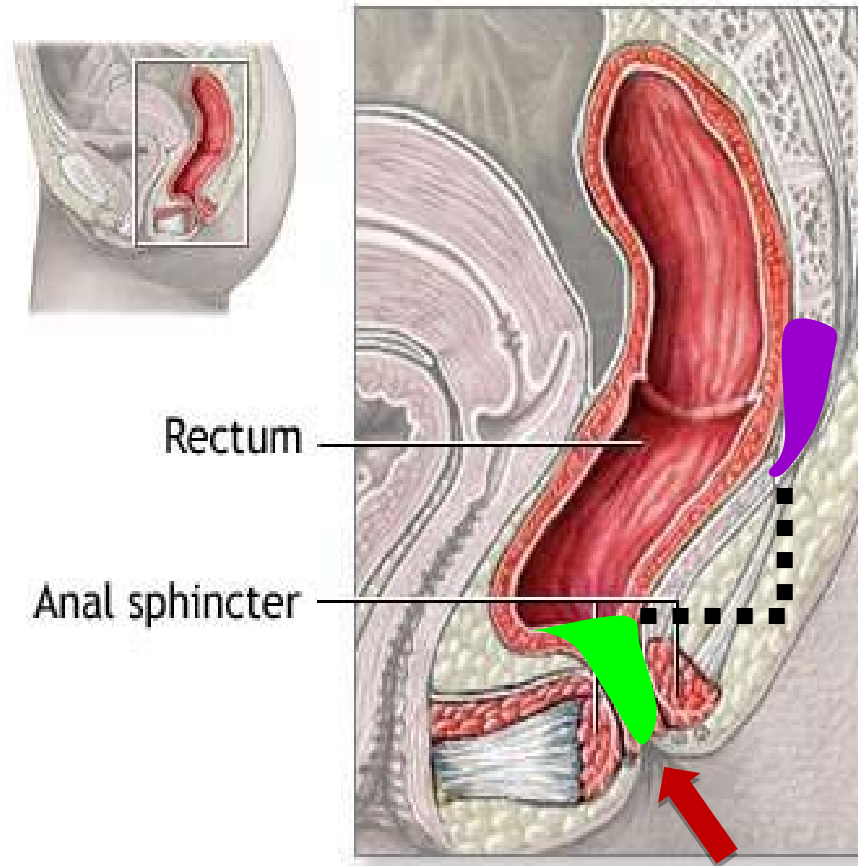
- 1. Describe** the site, size, beginning, termination & relations of the anal canal.
- 2. Correlate** the lining of the anal canal with its embryological origin & relevant clinical importance.
- 3. Compare** between the internal & external anal sphincters
- 4. Describe** the blood supply & lymphatic drainage of the anal canal.
- 5. Compare** between the upper & lower parts of the anal canal as regards development, arterial & nerve supply and venous & lymphatic drainage

## **KEY POINTS OF THE LECTURE**

1. Site, size, beginning ,termination & relations of the anal canal.
2. The lining of the anal canal with its embryological origin versus its relevant clinical importance.
3. The internal versus the external anal sphincters.
4. Blood supply & lymphatic drainage of the anal canal.
5. The upper versus the lower parts of the anal canal as regards development, arterial & nerve supply and venous & lymphatic drainage.

# The anal canal

- It is the terminal part of the large intestine.
- **Site :**
- **Begins** □ 1 inch below & in front of tip of coccyx
- **Ends** □ at anal orifice (anus)

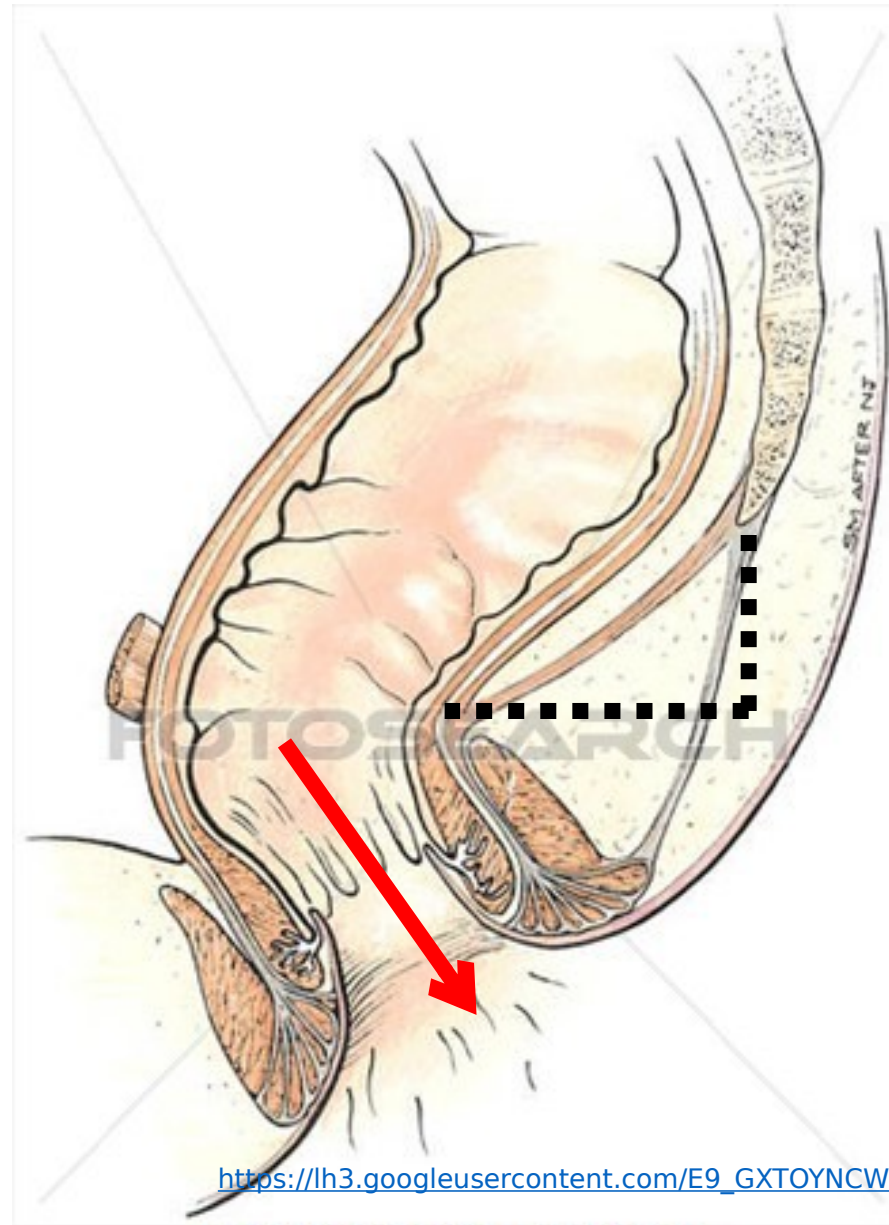


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**Direction** □  
**downward  
&  
backwards**

**Length** □  
**1.5 inches  
(4 cm )**



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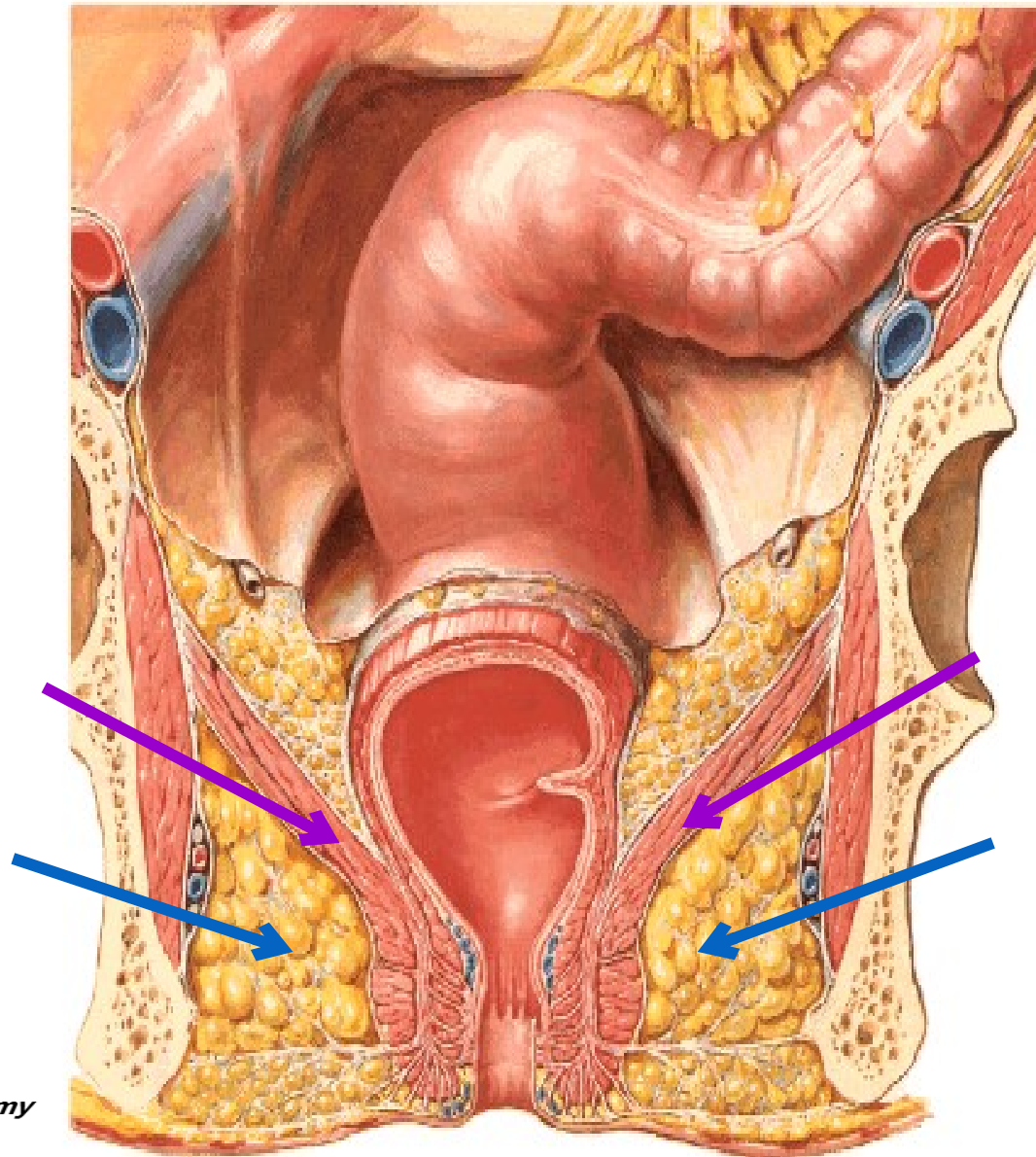
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- Relations
- On each side :

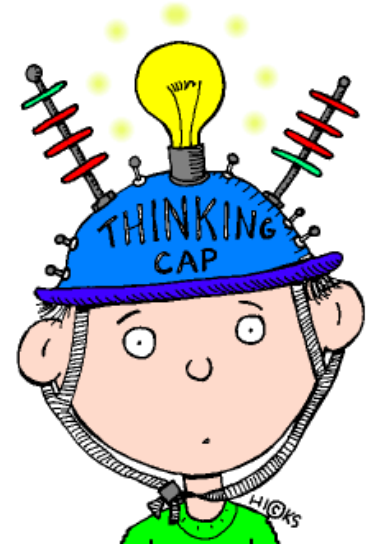
□ lower part lies in perineum & is related to ischiorectal fossa

□ upper part lies in pelvis & is related to levator ani

*Frank H. Netter  
Atlas of Human Anatomy  
6th edition*



# Test Yourself



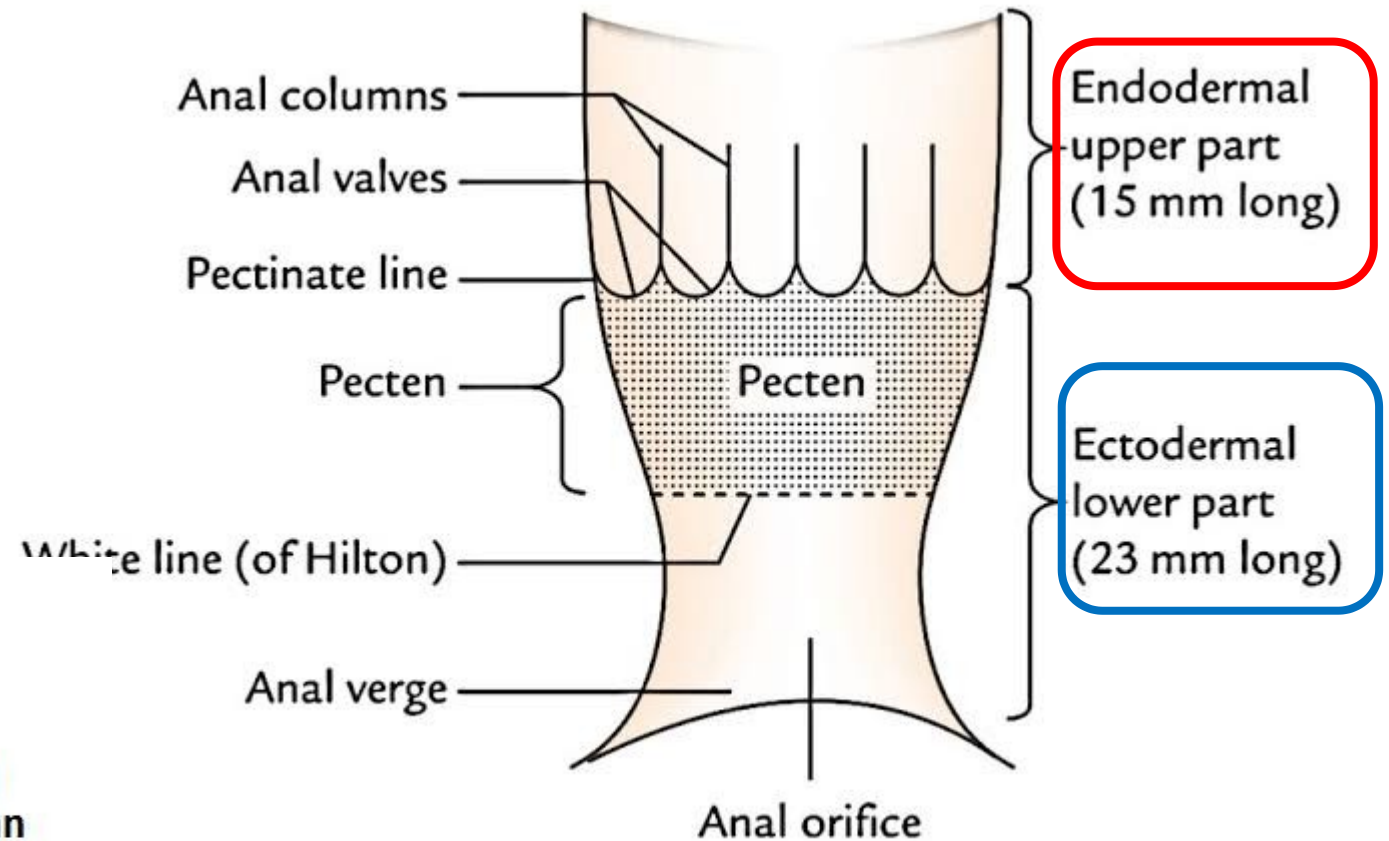
**The anal canal begins at which of the following sites?**

- ☒ **A. 1 inch below & in front of tip of coccyx**
- B. 1 cm below & in front of tip of coccyx**
- C. 2 inches below & in front of tip of coccyx**
- D. 4 cm below & in front of tip of coccyx**

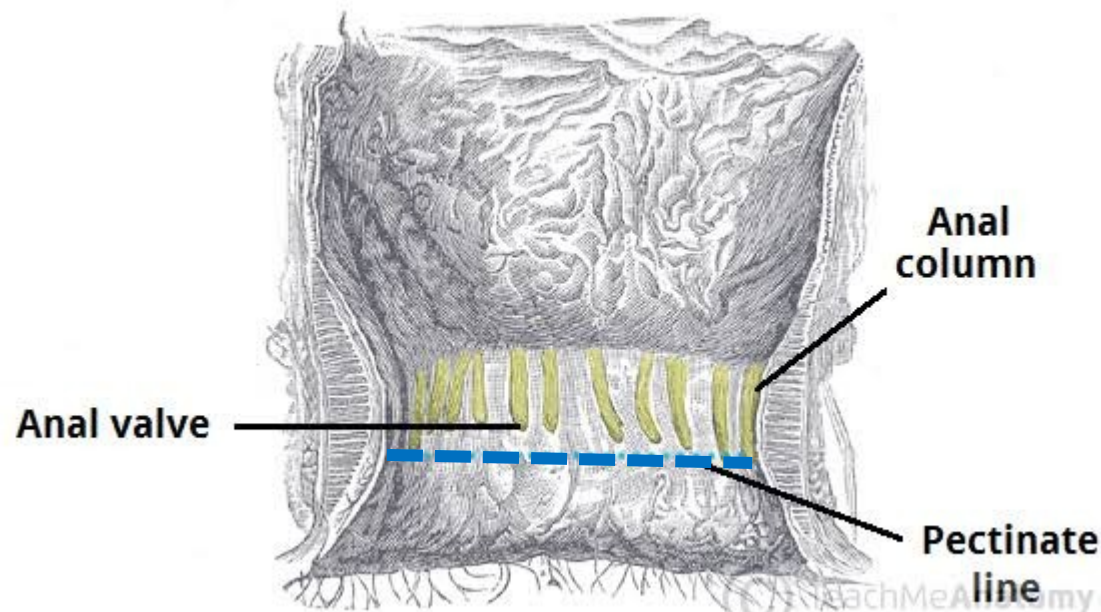


😊 The lining of upper part of anal canal is derived from **endoderm**

😊 The lining of lower part of anal canal is derived from **ectoderm**



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The junction between the 2 parts is demarcated by the **pectinate line** which represents the anal membrane in fetal life.

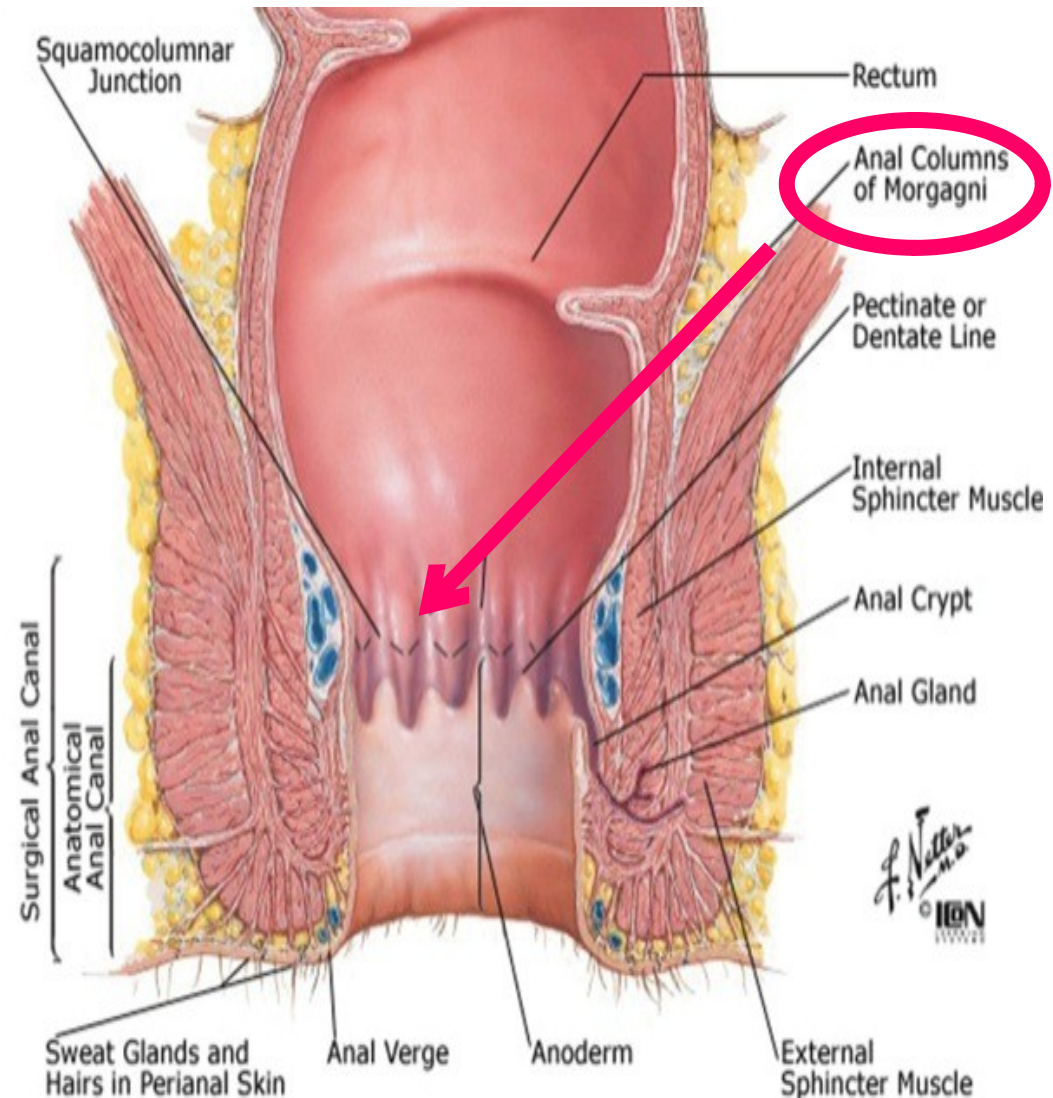
The area **above** the **pectinate line** :

- **Upper 15 mm:**

**Contain 6-10  
vertical folds  
(anal columns  
of**

**morgagni),  
each contains a  
terminal branch  
of the superior**

*Frank H. Netter  
Atlas of Human Anatomy  
6th edition*



- ❑ **Enlargement (varicosities) of the superior rectal veins causes internal hemorrhoids (piles)**
- ❑ **Common sites in the anal columns are**

Hemorrhoids



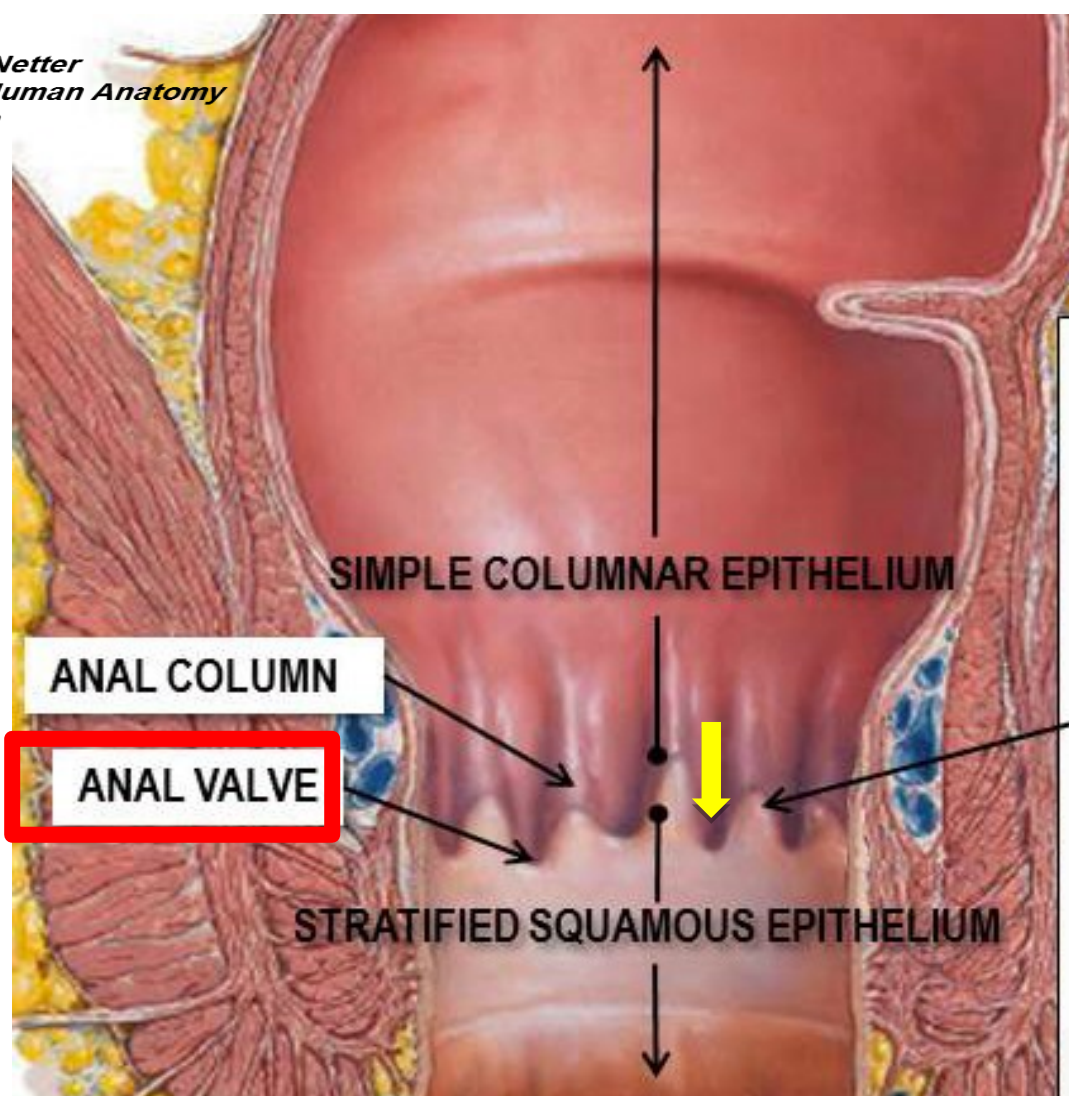
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Location of the terminal branches of the superior rectal artery in lithotomy position

internal

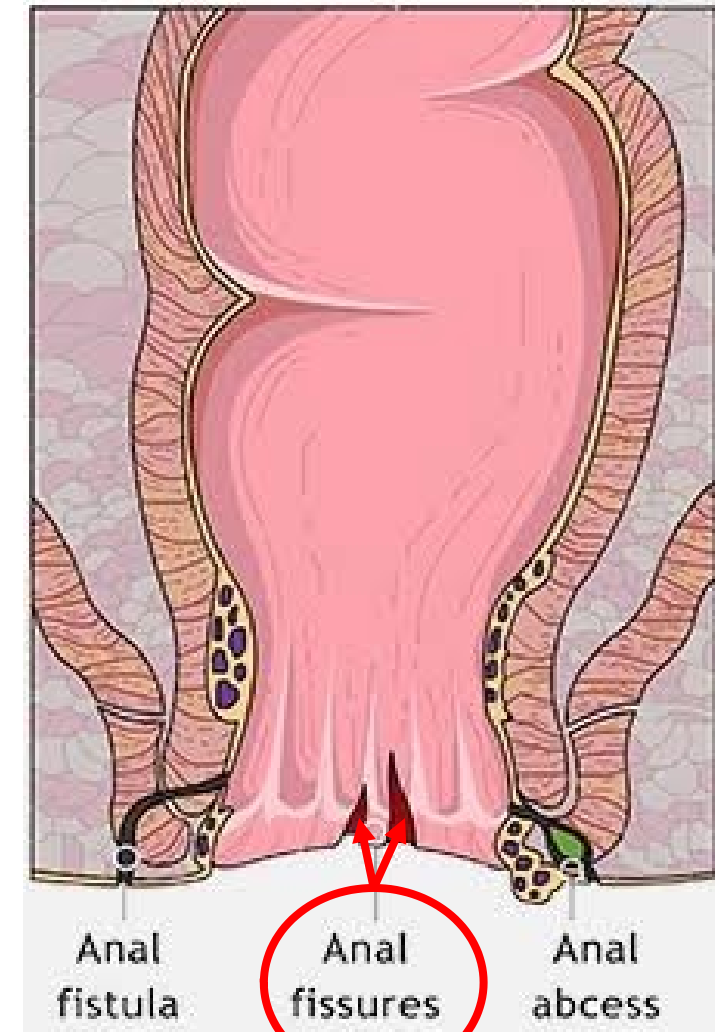
external





## CLINICAL NOTE:

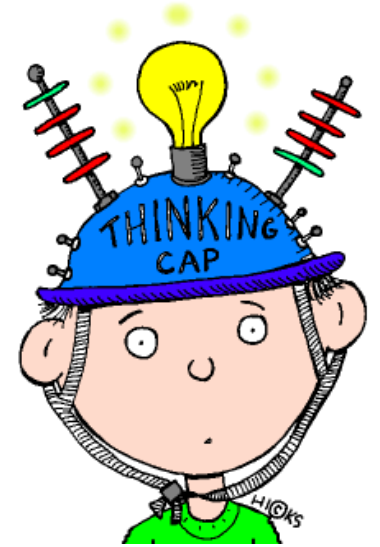
The anal valve maybe torn by hard faeces ☐ anal fissure



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The lower ends of the anal columns are joined by mucous folds (**anal valves**). Above each valve exists a **small recess or anal sinus**.

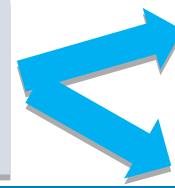
# Test Yourself



**Which of the following are the common sites for internal piles in the anal columns?**

- ☒ **A. 2,4 & 6 o'clock**
- B. 3,7 & 11 o'clock**
- C. 5, 9 & 12 o'clock**
- D. 1,9 & 12 o'clock**

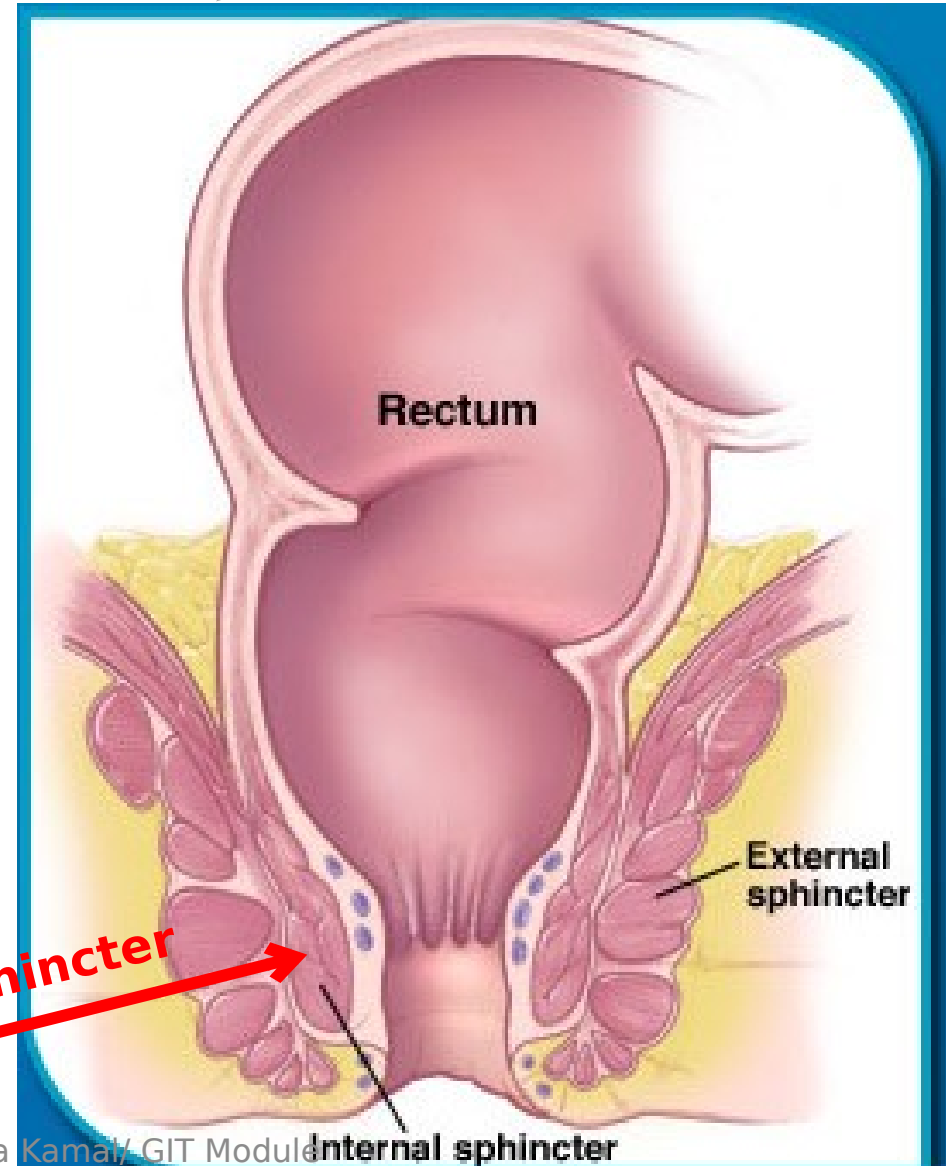
# Anal Sphincters



**Internal anal sphincter**  
**External anal sphincter**

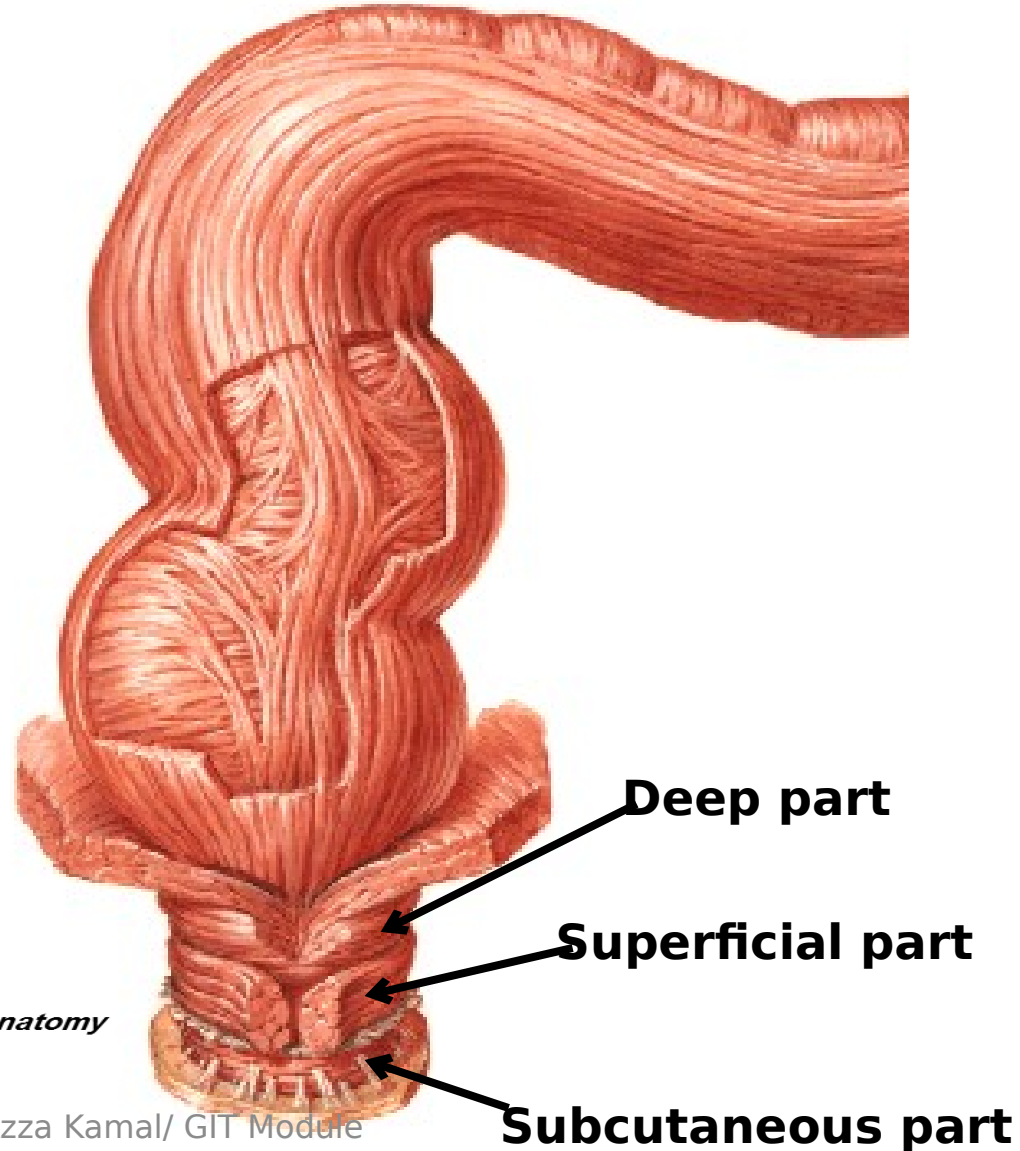
- **Internal anal sphincter:**
- **Surrounds upper  $\frac{3}{4}$  of anal canal**
- **Involuntary smooth circular m fibers**
- **Continuous above with circular muscle coat of rectum**

**Internal anal sphincter**



# External Anal Sphincter

- Surrounds the whole length of anal canal
- Composed of skeletal muscles (voluntary)
- Formed of 3 parts ☐ subcutaneous, superficial & deep parts



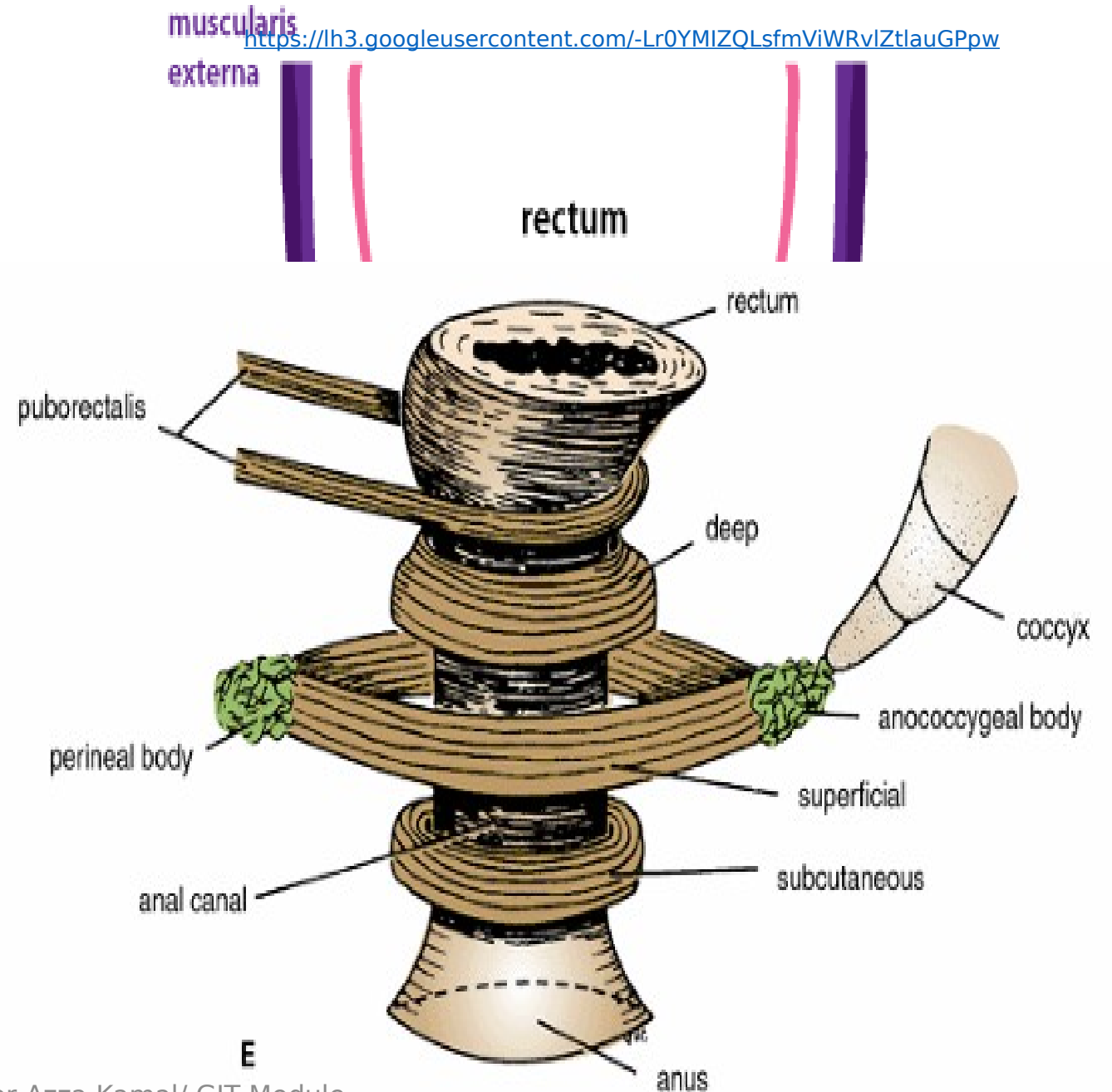
*Frank H. Netter  
Atlas of Human Anatomy  
6<sup>th</sup> edition*

# Subcutaneous

**part :**

➤ Surrounds the lower  $\frac{1}{4}$  of anal canal below the level of internal anal sphincter

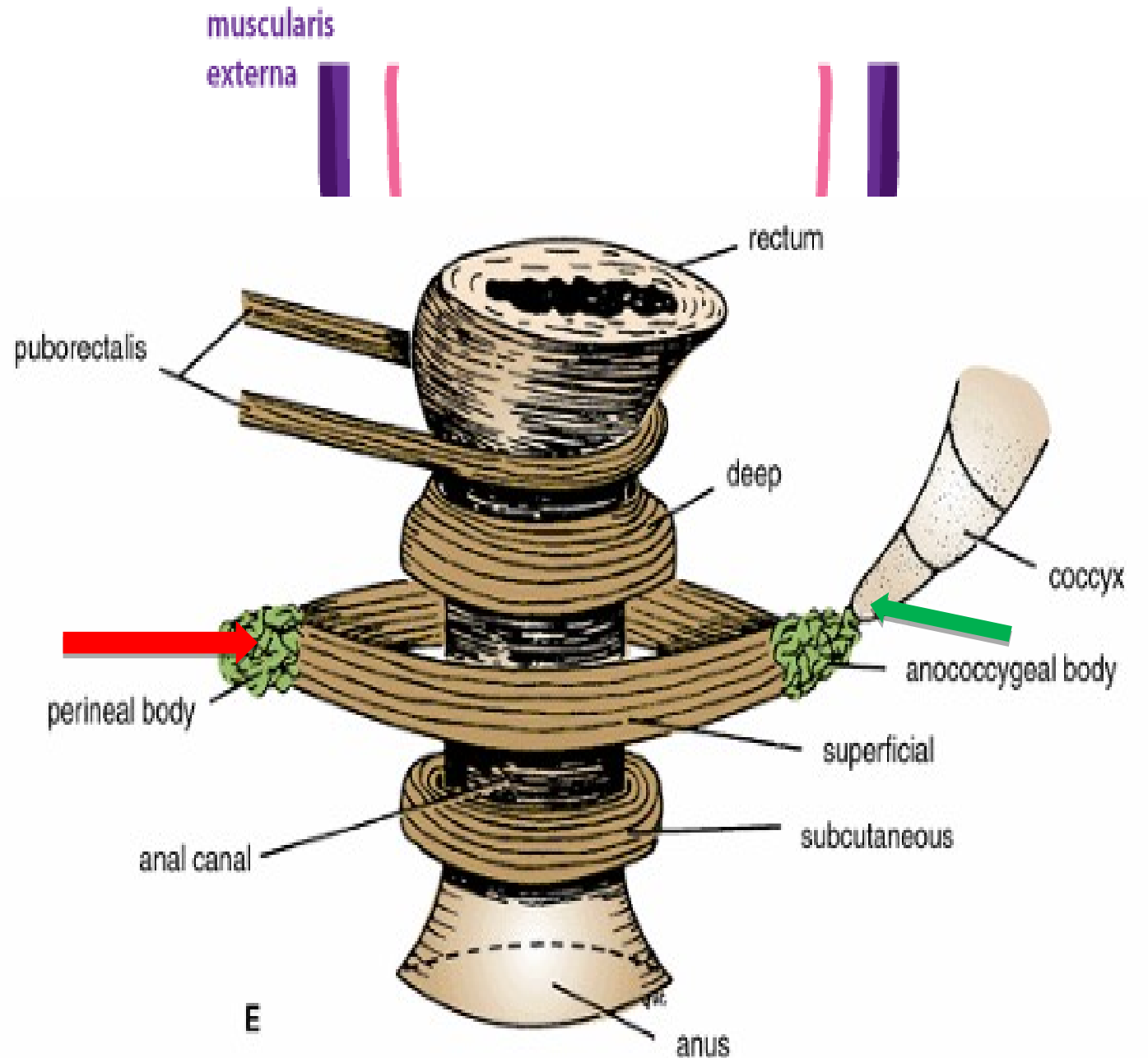
➤ It lies beneath the skin at the anal orifice





## Superficial part:

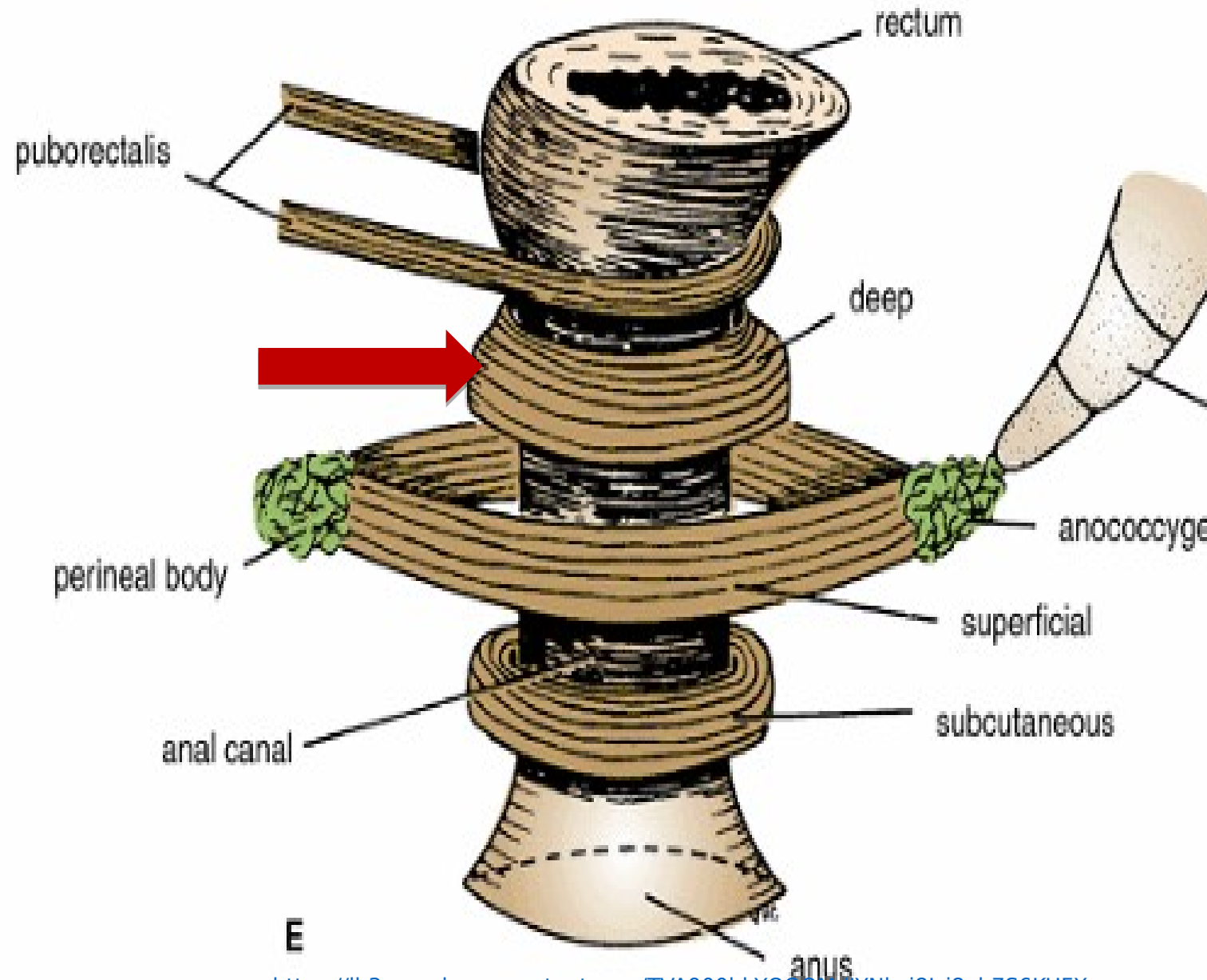
- Lies superior to the subcutaneous part
- It is attached anteriorly to **perineal body** & posteriorly to **tip of coccyx**



## Deep part :

- Surrounds upper part of anal canal.
- It lies superior to superficial part of external

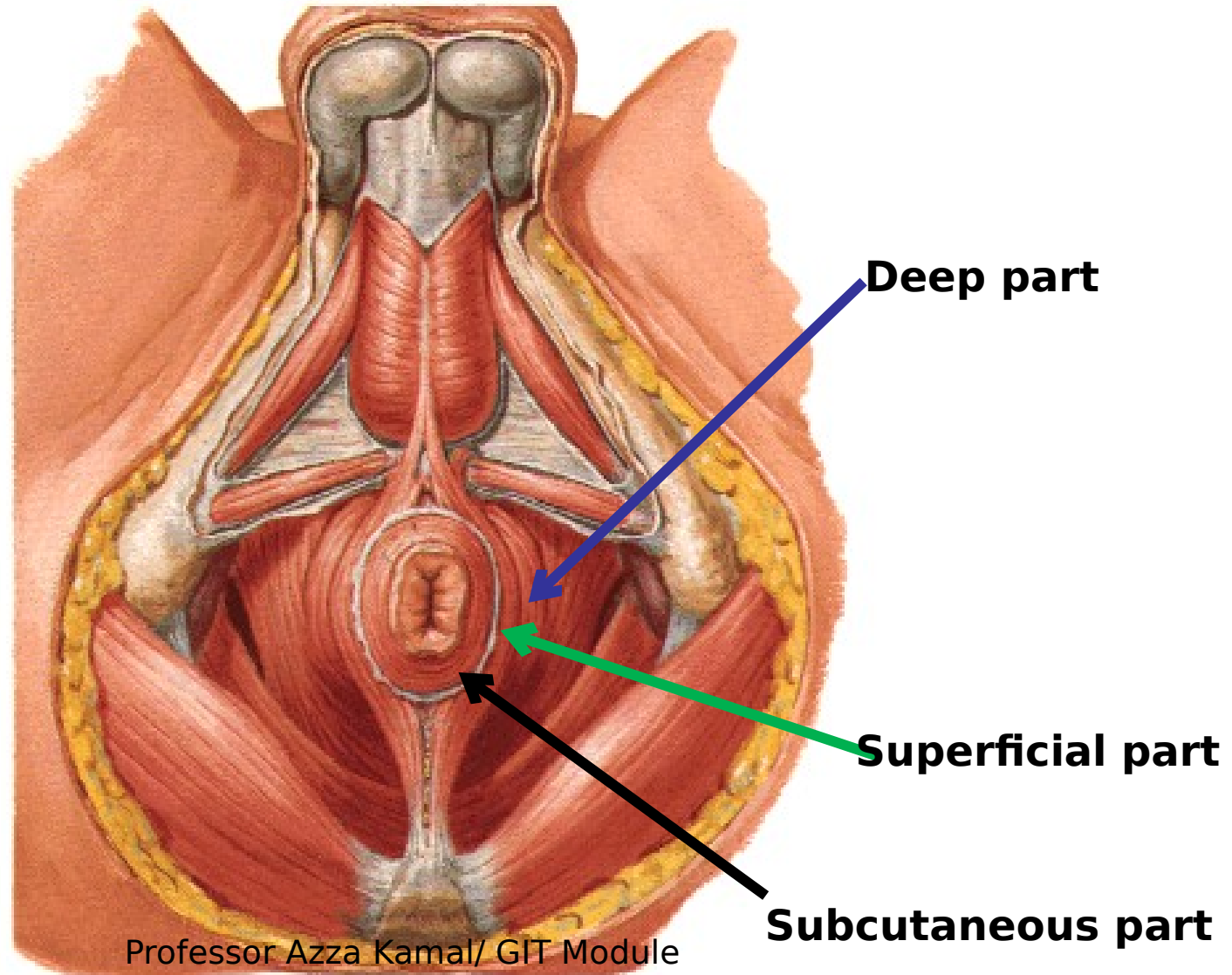
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# External Anal Sphincter Muscle of Male

## Perineal View



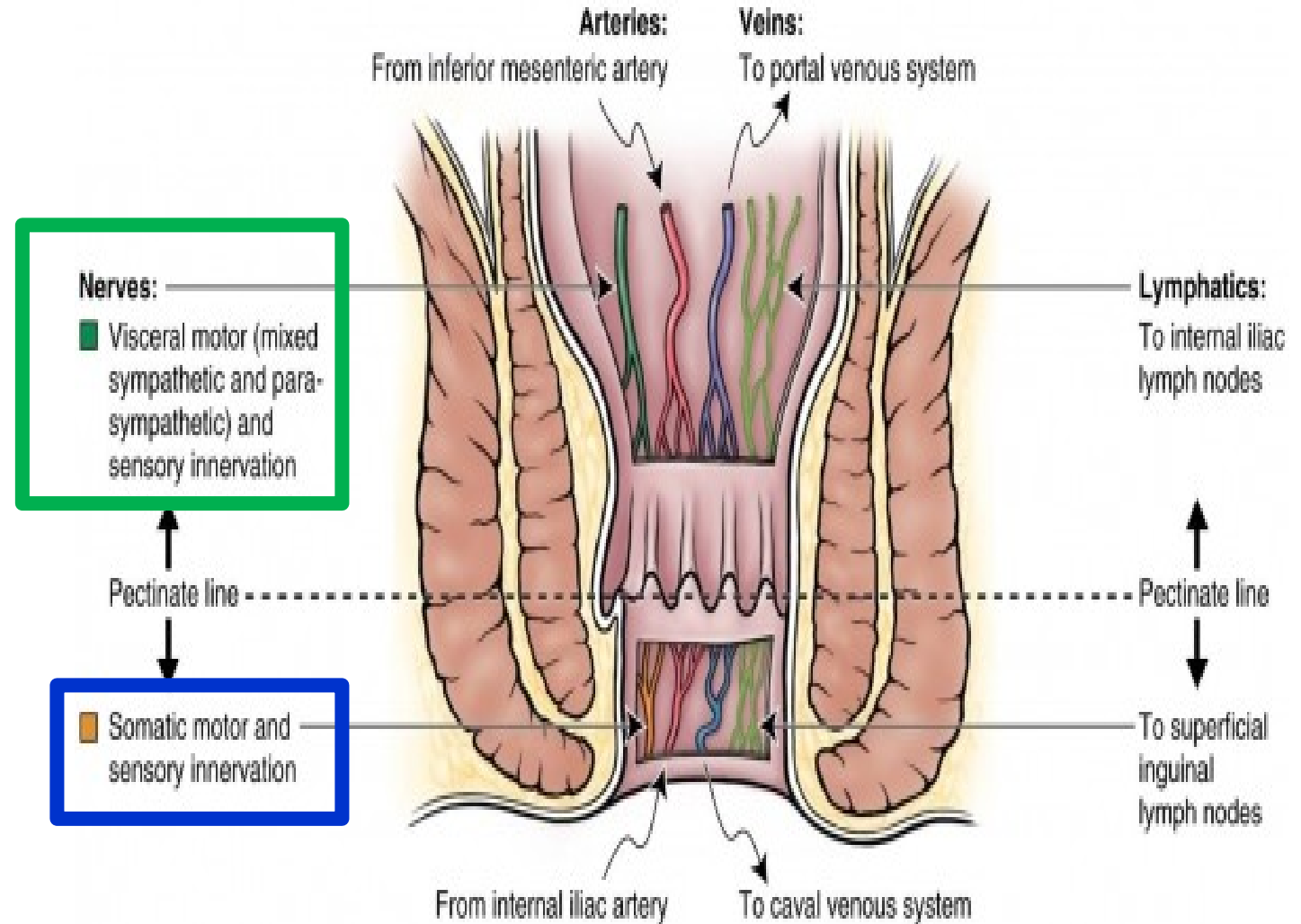
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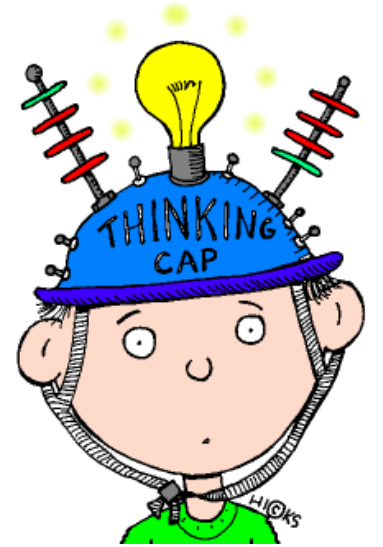
# Nerve supply of anal sphincters

- **Internal anal sphincter** □ **by autonomic fibers (involuntary)**
- **External anal sphincter (voluntary)** □ **by somatic nerves**  
( inferior rectal nerve S2,3 & perineal branch of S4)



<https://lh3.googleusercontent.com/CIR-qtDPLsheMkpV>

# Test Yourself



**Which of the following parts of the external anal sphincter is attached to the perineal body & to the coccyx?**

- A. Subcutaneous part**
- ☐ **B. Superficial part**
- C. Deep part**

# Blood Supply of anal canal

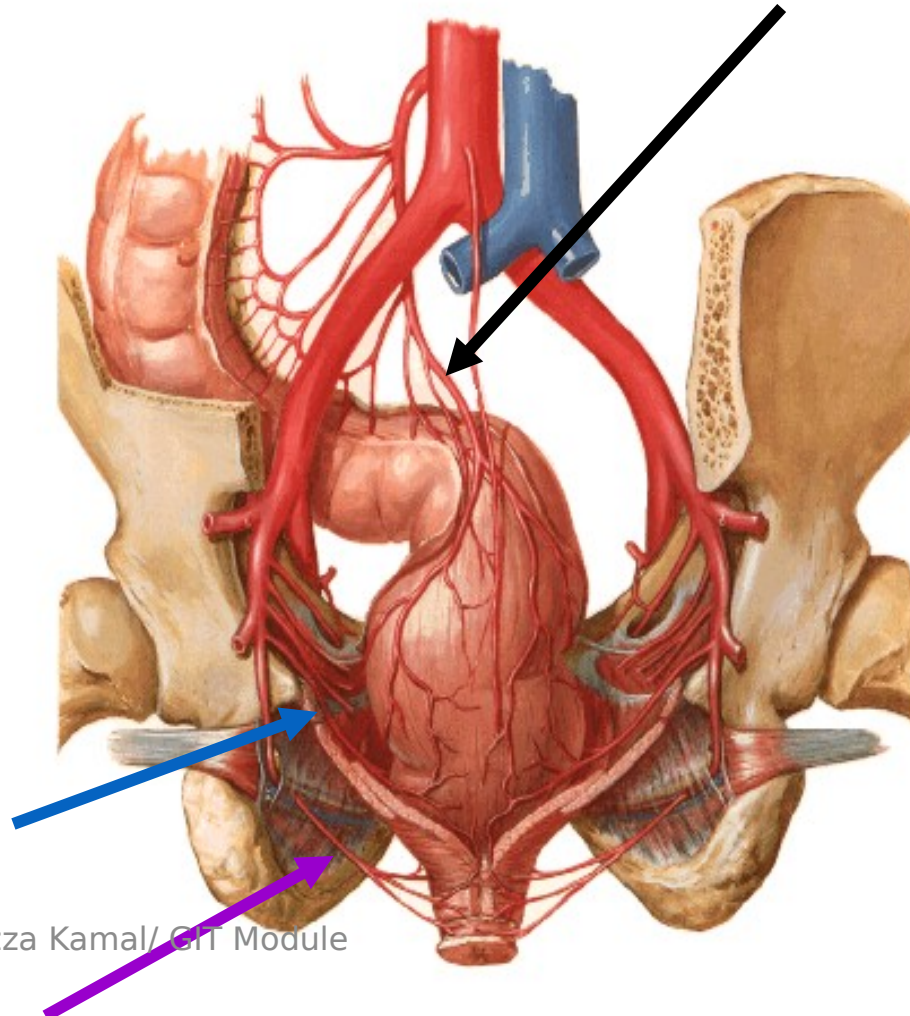
- Same as rectum

1. Superior rectal artery

2. Middle rectal artery

3. Inferior rectal artery

*Frank H. Netter  
Atlas of Human Anatomy  
6th edition*

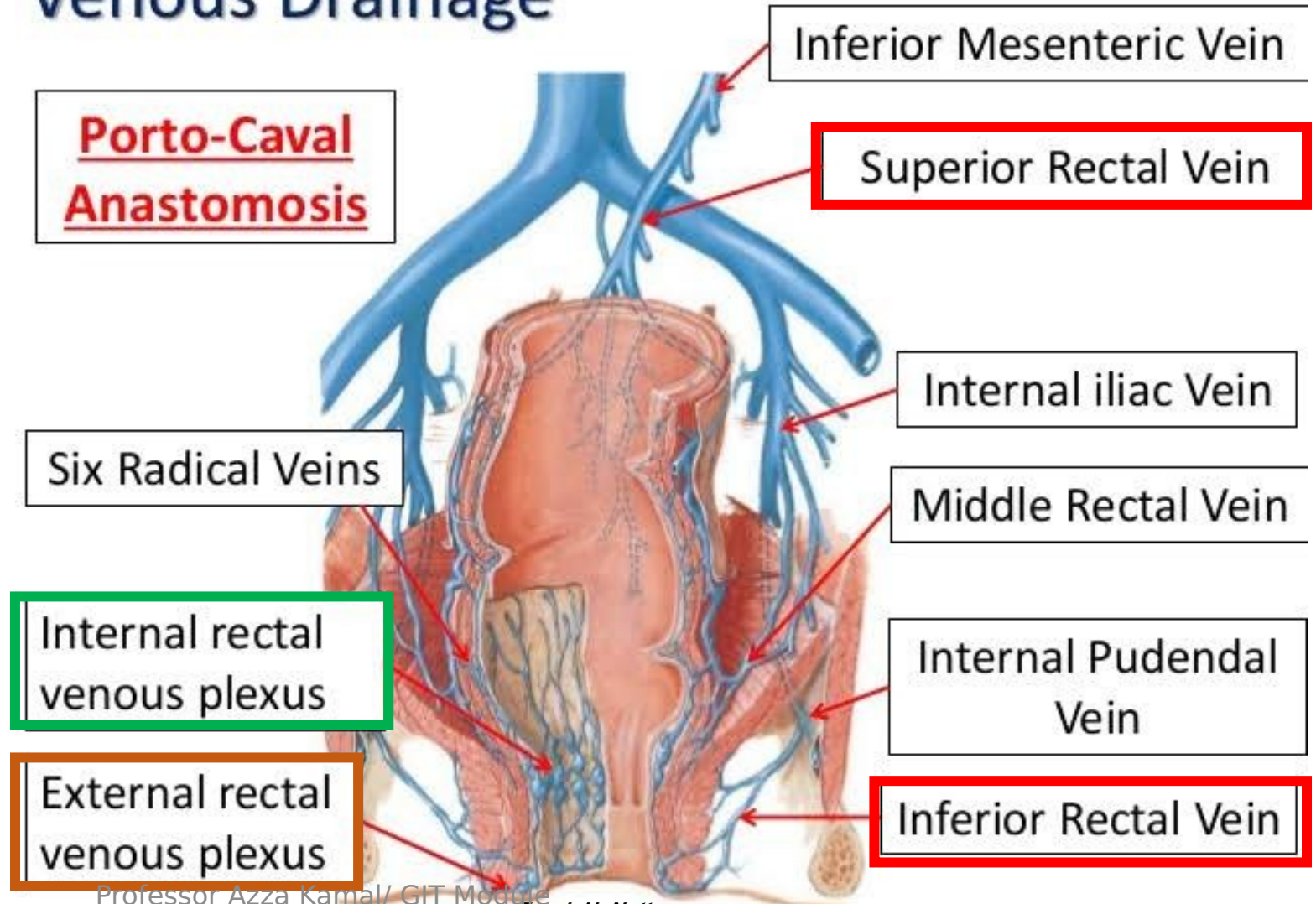




# Venous drainage of anal canal

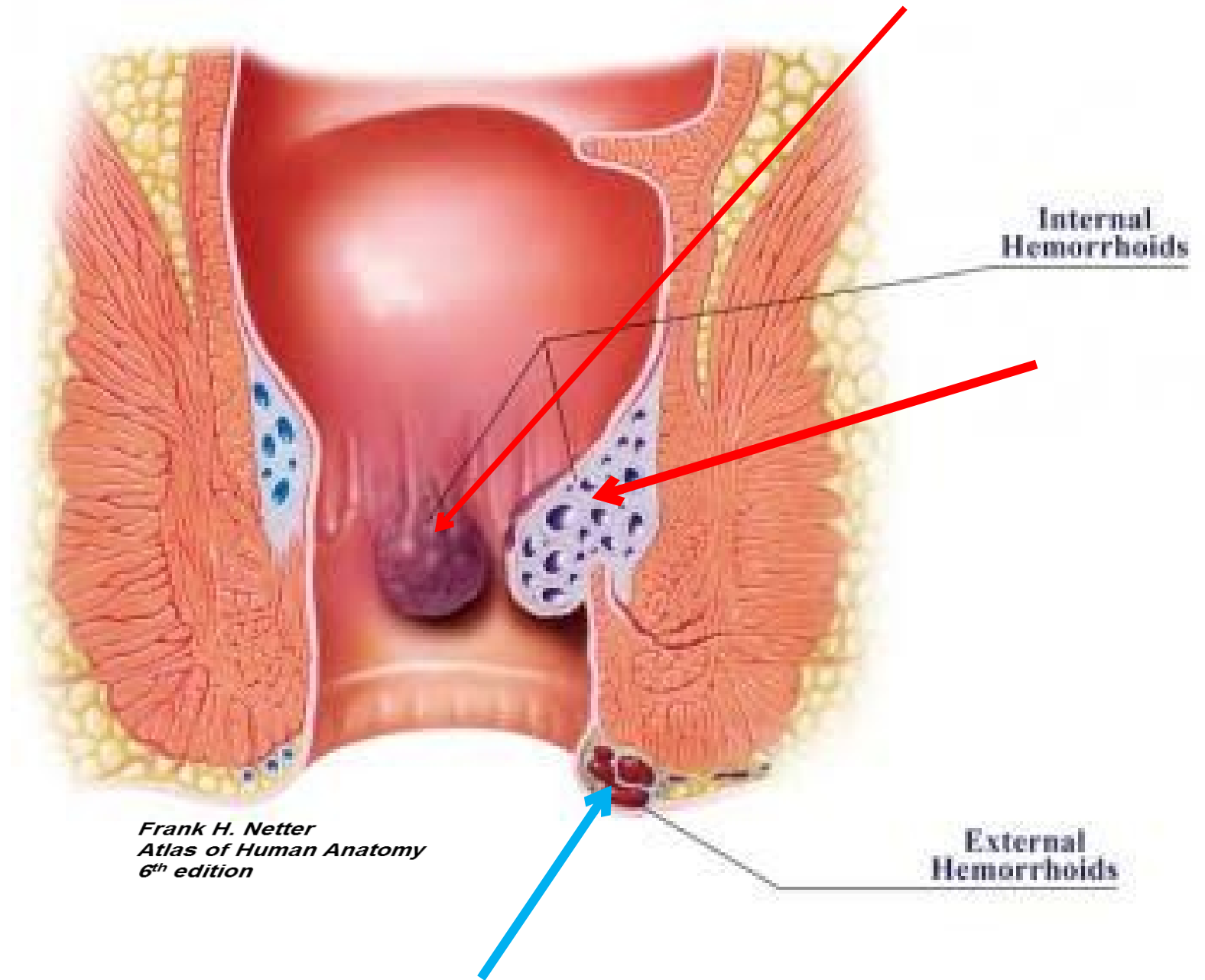
- Internal rectal venous plexus is present in submucosa of anal canal ☐ drains into superior and inferior rectal veins
- External rectal venous plexus lies outside internal & external anal

## Venous Drainage



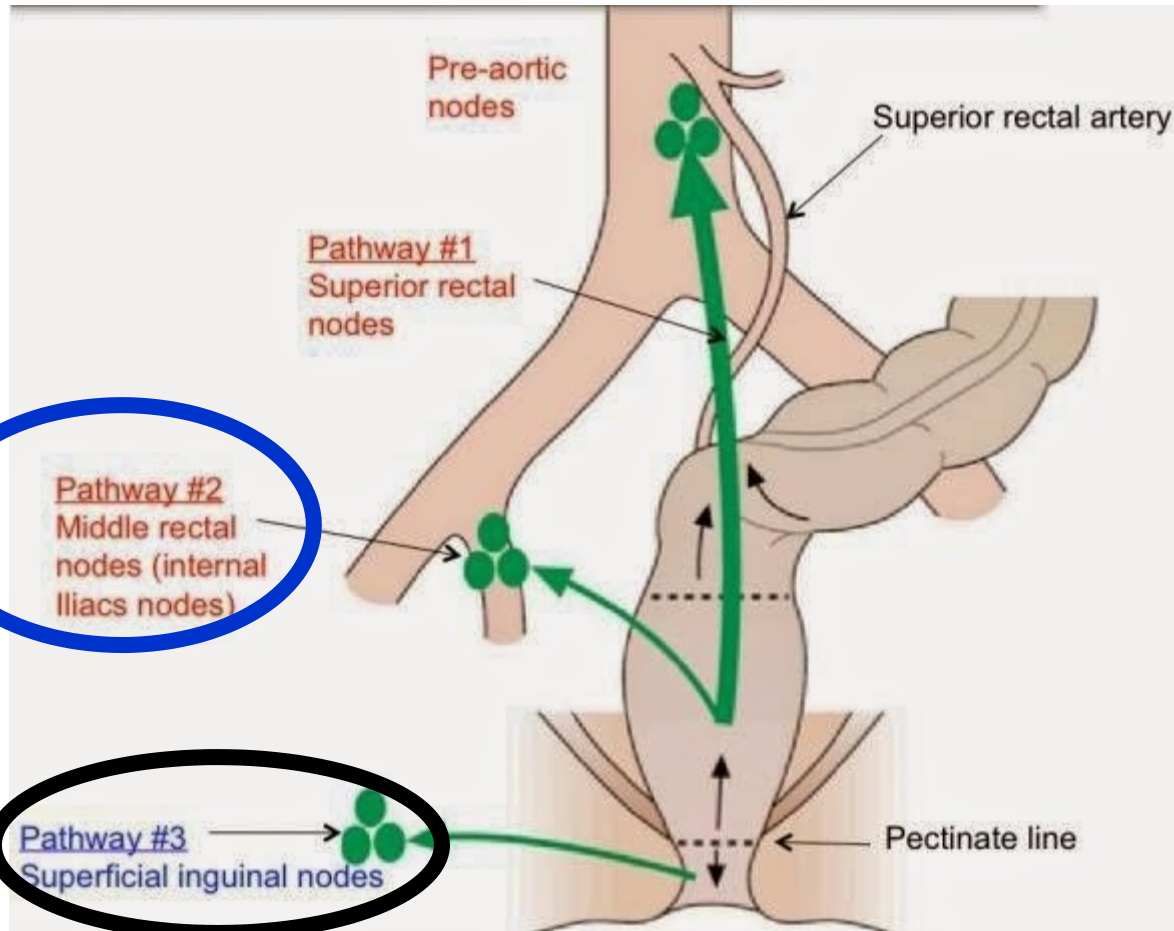
In cases of portal hypertension  
□ dilated tortuous veins from the internal rectal venous plexus  
□ **internal**

Enlargement and tortuosity of veins of the external rectal venous plexus leads to **external haemorrhoids**

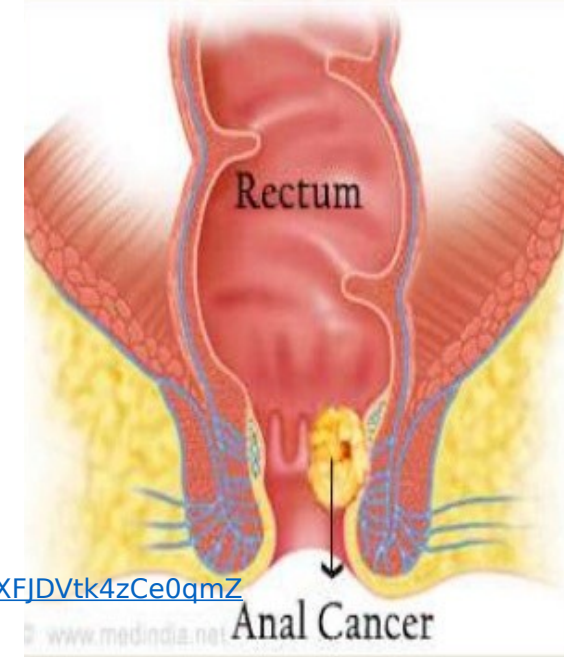




# Lymphatic drainage of anal canal



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## Important Clinical Note:

A patient with enlarged inguinal lymph nodes might think he has inguinal hernia.

The physician discovers cancer of lower part of anal canal → sending metastases to the inguinal L.N

- Upper part → internal iliac LN
- Lower part → superficial inguinal LN

## Anal canal is composed of 2 structurally & developmentally different upper & lower parts

	Upper part	Lower part
Origin	Endodermal	Ectodermal
Nerve supply	Autonomic nerve supply as rectum *( sensitive to stretch) but insensitive to pain, touch & temperature	Somatic nerve supply Inferior rectal nerve as perineal skin * (sensitive to pain, touch & temperature)
Lymphatic drainage	To internal iliac L.N.	To superficial inguinal L.N.
Blood supply	Superior rectal a	Inferior rectal a
	Superior rectal vein → portal circulation	Inferior rectal vein → systemic circulation

# Quiz



**Compare between the upper and lower parts of the anal canal?**

# THE END



## **Suggested Reading:**

**Clinical Anatomy for Medical Students: Richard S. Snell**

**Pages 376-380**

**393- 395**